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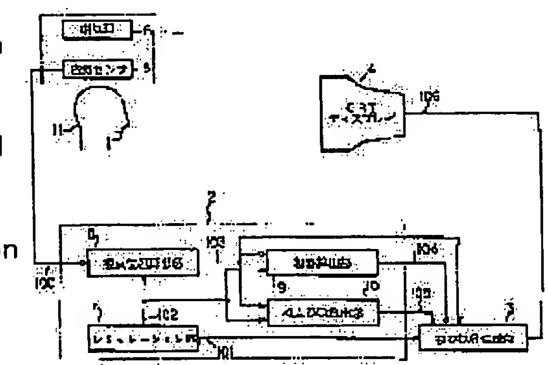
(54) PSEUDO VISIBILITY DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To obtain a sense similar to real experience for a user when it is applied to a simulator, etc., by calculating respective information related to a position of a viewpoint, a visual field and posture in a virtual space based on the position of the head in a rear space, using these information and generating a pseudo visibity image observed from the viewpoint of the user in the virtual space.



SOLUTION: An on-head sensor 1 detects magnetism generated from a magnetic source 6 by a magnetic sensor 5 to output the head position data 100 of the head of the user 11. A visibility display information calculation par 2 is provided with a simulation part 7, a viewpoint position calculation part 8, visual field calculation part 9 and a viewpoint posture calculation part 10, and the simulation part 7 outputs the pseudo calculation result data 101 to a pseudo visibility generation part 3. Further, the part 7 calculates a three- dimensional position of an image display part of a CRT display 4 in the virtual space based on the pseudo calculation result to output the virtual position data 102 to the viewpoint position calculation part 8, the visual field calculation part 9 and the viewpoint posture calculation part 10 respectively.

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Ａ６３Ｆ　9/22			Ａ６３Ｆ　9/22	Ｂ
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Ｇ０９Ｂ　9/34				Ａ

審査請求　未請求　請求項の数１　ＯＬ　（全６頁）　最終頁に続く

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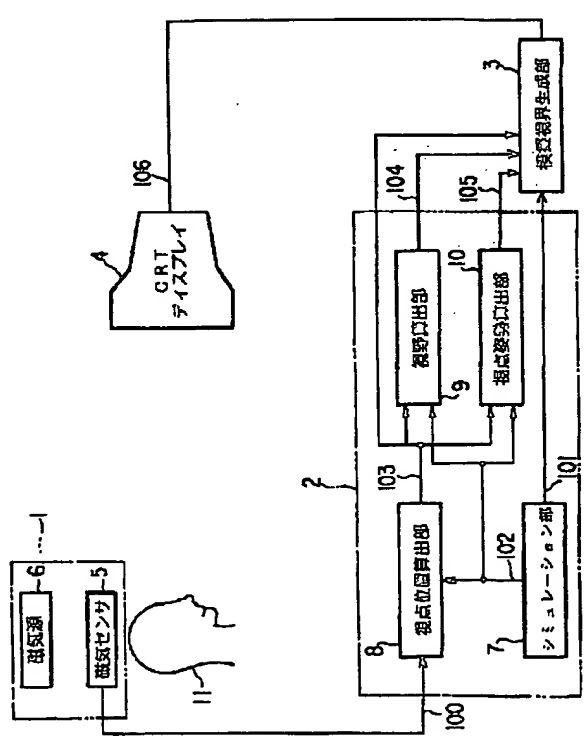
(54)【発明の名称】　模擬視界装置

(57)【要約】
【課題】実空間の視点の移動と連動して仮想空間における模擬視界画像が変化する模擬視界装置を提供する。
【解決手段】予め設定されている仮想空間において使用者の操作に応じた模擬視界画像を生成する模擬視界装置において、実空間における使用者の頭部の位置および姿勢を検出する頭部位置検出部１と、この実空間における使用者の頭部の位置および姿勢に基づいて、仮想空間における使用者の視点の位置、視野、および姿勢に関する各情報を算出する視界表示情報算出部２と、この仮想空間における視点の位置、視野、および姿勢に関する各情報を使用して、仮想空間における使用者の視点から観測される模擬視界画像を生成する模擬視界生成部３と、この模擬視界画像３を表示する模擬視界表示部４とを有する。



【特許請求の範囲】

【請求項1】予め設定されている仮想空間において使用者の操作に応じた模擬視界画像を生成する模擬視界装置において、

実空間における使用者の頭部の位置および姿勢を検出する頭部位置検出手段と、

前記頭部位置検出手段によって検出された実空間における使用者の頭部の位置および姿勢に基づいて、仮想空間における使用者の視点の位置、視野、および姿勢に関する各情報を算出する視界表示情報算出手段と、

前記視界表示情報算出手段によって算出された仮想空間における視点の位置、視野、および姿勢に関する各情報を使用して、仮想空間における使用者の視点から観測される模擬視界画像を生成する模擬視界生成手段と、

前記模擬視界画像生成手段によって生成された模擬視界画像を表示する模擬視界表示手段とを有することを特徴とする模擬視界装置。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、例えば各種のシミュレータもしくは娯楽用の遊具に適用する模擬視界装置に関する。

【０００２】

【従来の技術】近年、例えば自動車や航空機の運転シミュレータやビデオゲーム装置に適用する模擬視界装置が開発されている。このような模擬視界装置には、使用者の操作に応じてあたかも実際の経験と同等の感覚を得ることのできる機能が求められる。このための方法の一つとして、計算機によって目的とする仮想空間を作成し、使用者の操作に応じて変化する模擬計算処理の結果を模擬視界画像に変換して表すことが行われている。

【０００３】このような模擬視界装置では、例えば以下のように模擬視界画像が生成される。すなわち、実空間における使用者の視点および表示画面の三次元的な位置関係に基づいて、仮想空間における使用者の視点および表示画面の三次元的な位置が予め設定される。この設定された位置に基づいて、例えば仮想空間において使用者の視点から表示画面を見た場合の視点の位置、仮想空間において視点から表示画面を見た場合の視野の広さ、および仮想空間において視点から表示画面を見た場合の視点の姿勢に関する各情報が算出される。これらの視点の位置、視野の広さ、および視点の姿勢に関する各情報に基づいて、仮想空間における使用者の視点から観測される模擬視界画像が生成される。

【０００４】この結果、従来の模擬視界装置を例えば自動車の運転のシミュレータに適用すると、仮想空間の自動車の模擬的進行と共に仮想空間における視点および表示画面が進行する。従って、表示画面に写しだされる模擬視界画像が更新され、使用者はあたかも実際に自動車に乗って進行しているかのように感じることになる。

【０００５】ところで、従来の模擬視界装置においては、仮想空間における使用者の視点の位置、視野の広さ、および視点の姿勢に関する各情報の値はそれぞれ一定値として設定される。つまり、従来の模擬視界装置においては、仮想空間の視点と表示画面との三次元的な位置関係は常に一定であった。

【０００６】ところで、一般に使用者は頭を動かしたり首を振ったりするために、実空間においては使用者の視点と表示装置との三次元的な位置関係が変動することがある。ここで、仮想空間において使用者の視点から表示画面を見るということを、例えば実空間において人が窓から景色を見ることと同等であると仮定してみる。人が窓から景色を見ているときに視点の位置を変化させると、窓から見える景色はそれに応じて変化し、窓から近い位置の景色ほど変化は大きくなる。すなわち、仮想空間において視点の位置が変化すると、表示画面の模擬視界画像はそれに応じて変化し、その変化は仮想空間において表示画面に近いところほど大きくなると考えられる。

【０００７】しかし、上述したように従来の模擬視界装置においては、仮想空間の視点と表示画面との三次元的な位置関係は常に一定であり、実空間の視点の位置が変化しても表示画面の模擬視界画像が変化することはなく、使用者に実際の経験とは異なる感覚を与えてしまっていた。

【０００８】

【発明が解決しようとする課題】上述したように従来の模擬視界装置においては、仮想空間における使用者の視点と表示画面との三次元的な位置関係は常に一定であるため、実空間において使用者の視点が移動しても仮想空間の模擬視界画像は変化しないという問題点があった。本発明は、実空間の使用者の視点の移動と連動して仮想空間における模擬視界画像が変化する模擬視界装置を提供することを目的とする。

【０００９】

【課題を解決するための手段】上記課題を解決するため本発明は、実空間の視点の変化に連動して仮想空間の視点を変化させて、模擬視界画像を生成することを骨子としている。すなわち本発明は、予め設定されている仮想空間において使用者の操作に応じた模擬視界画像を生成する模擬視界装置において、実空間における使用者の頭部の位置および姿勢を検出する頭部位置検出手段と、頭部位置検出手段によって検出された実空間における使用者の頭部の位置および姿勢に基づいて、仮想空間における使用者の視点の位置、視野、および姿勢に関する各情報を算出する視界表示情報算出手段と、視界表示情報算出手段によって算出された仮想空間における視点の位置、視野、および姿勢に関する各情報を使用して、仮想空間における使用者の視点から観測される模擬視界画像を生成する模擬視界生成手段と、模擬視界画像生成手段

によって生成された模擬視界画像を表示する模擬視界表示手段とを有する。

【0010】このような構成の模擬視界装置においては、実空間における頭部の位置および姿勢に基づいて仮想空間における視点の位置、視野、および姿勢に関する各情報が算出される。そして、算出された各情報を使用して、仮想空間における使用者の視点から観測される模擬視界画像が生成される。

【0011】そのため、実空間において使用者が例えば頭を動かすなどして視点が移動した場合でも、その実空間の視点の変化に応じて仮想空間の視点が変化する。そして、変化した仮想空間の視点と表示画面との三次元的な位置関係に基づいて、模擬視界画像が生成される。つまり、実空間の使用者の視点の移動にともなって模擬視界画像も変化するので、使用者はより現実に近い感覚を得ることが可能となる。

【0012】ここで、仮想空間における視点の位置とは、例えば仮想空間における視点の三次元的な座標である。また、仮想空間における視点の視野とは、例えば仮想空間に模擬視界表示手段の位置を仮定した場合に、視点から模擬視界表示手段を見た場合に観測される仮想空間の広さである。さらに、仮想空間における視点の姿勢とは、仮想空間の視点から模擬視界表示手段を見た場合の姿勢、すなわち使用者の視線方向と左右の傾きである。

【0013】

【発明の実施の形態】

（装置の構成）図１は、本発明の実施形態に係る模擬視界装置の構成を示すブロック図である。この模擬視界装置は大別して、頭部センサ１、視点表示情報算出部２、模擬視界生成部３、およびＣＲＴディスプレイ４を有している。

【0014】頭部センサ１は、磁気センサ５および磁気源６を有し、磁気センサ５によって磁気源６から発生する磁気を検知し、使用者１１の頭部の三次元的な位置である頭部位置データ１００を出力するものである。

【0015】磁気センサ５は、例えばホール素子、磁気抵抗素子などから構成されており、磁気源６から発生する磁気を十分検知できる範囲で、磁気源６に対して三次元的な相対位置を変化させることができる場所に設置するものである。具体的には、磁気センサ５は使用者１１の被るヘルメット等に設置される。

【0016】磁気源６は、ＣＲＴディスプレイ４に対する三次元的な相対位置が一定であるように構成される。具体的には、磁気源６は使用者１１が座る座席に設置され、この座席とＣＲＴディスプレイ４とが結合して構成される。

【0017】本実施形態の視界表示情報算出部２は、シミュレーション部７、視点位置算出部８、視野算出部９、および視点姿勢算出部１０を有しており、通常では汎用計算機により構成されるものである。

【0018】シミュレーション部７は、目的とする仮想空間が予め設定されていて、この仮想空間において使用者の操作に応じた模擬計算処理を実行し、さらに模擬計算の処理結果に基づいて仮想空間における表示画面の位置を算出するものである。

【0019】具体的には、シミュレーション部７は、仮想空間において使用者の操作に応じた所定の模擬計算処理を実行し、この処理結果である模擬計算結果データ１０１を模擬視界生成部３に出力する。次に、シミュレーション部７は、模擬計算の結果に基づいて、仮想空間におけるＣＲＴディスプレイ４の画像表示部の三次元的な位置を算出し、この処理結果である仮想位置データ１０２を視点位置算出部７、視野算出部７、および視点姿勢算出部１０のそれぞれに出力する。

【0020】ここで、例えば本実施形態を自動車の運転シミュレータに適用する場合、シミュレーション部７は自動車の走行を模擬する計算処理を実行し、仮想空間における表示画面（実際の自動車ではフロントガラスに相当する）の中心位置について、模擬されている仮想空間における三次元的な位置を算出する。

【0021】視点位置算出部８は、頭部センサ１から出力される頭部位置データ１００と予め定められた磁気源６とＣＲＴディスプレイ４との三次元的な位置関係に基づいて、使用者１１の頭部におけるＣＲＴディスプレイ４に対する三次元的な位置を算出するものである。

【0022】視点位置算出部８は、さらに、使用者１１の頭部におけるＣＲＴディスプレイ４に対する三次元的な位置、予め設定されている使用者１１の頭部と視点との三次元的な位置関係、およびシミュレーション部７から出力される仮想位置データ１０２のそれぞれに基づいて、仮想空間における使用者１１の視点の三次元的な位置を算出し、この処理結果である視点位置データ１０３を、模擬視界画像生成部３、視野算出部９、および視点姿勢算出部１０のそれぞれに出力するものである。

【0023】ここで、視点位置算出部８は、上述した仮想空間における使用者１１の三次元的な位置の算出において、例えば使用者１１の両眼の中心位置を使用者１１の視点とし、使用者１１はＣＲＴディスプレイ４に対してある方向に顔を向けていると仮定して幾何学的に視点位置を算出する。なお、使用者１１の頭部と視点との三次元的な位置関係は、予めカメラ等で使用者１１を撮影して個別に位置のデータをとり、このデータに基づいて設定するようにしてもよい。

【0024】視野算出部９は、シミュレーション部７から出力される仮想位置データ１０２と、視点位置算出部８から出力される視点位置データ１０３とに基づいて、仮想空間において使用者１１の視点からＣＲＴディスプレイ４の表示画面を見た場合に、仮想空間の画像がどの程度の視野で見えるかを算出し、例えば視野角や、仮想

空間の座標範囲で示して、視野データ１０４として出力するものである。

【００２５】視点姿勢算出部１０は、シミュレーション部７から出力される仮想位置データ１０２と、視点位置算出部８から出力される視点位置データ１０３とに基づいて、使用者１１の視点の姿勢、すなわち使用者１１の視線方向と左右の傾きとを算出し、例えばマトリクスや角度などで示して、視点姿勢データ１０５として出力するものである。

【００２６】図２は、同実施形態における視点位置データ１０３、視野データ１０４、および視点姿勢データ１０５の例を示した図である。今、仮想空間において使用者１１の視点１２からＣＲＴディスプレイ４の表示画面１３を見ることを想定する。この場合、視点１２の視点位置データ１０３が仮想空間の座標（ｘ，ｙ，ｚ）によって示されている。また、視点１２の位置から表示画面１３を見たときの仮想空間の視野データ１０４が、視点１２と表示画面１３の中心１４とを結んだ直線と、視点１２と表示画面１３の右上端１５とを接続した直線との角度である視野角θによって示されている。さらに、視点１２の視点姿勢データ１０５が、視点１２に対する表示画面の中心１４についてのベクトルα，β，γとして示されている。

【００２７】模擬視界生成装置３は、シミュレーション部から出力される模擬計算結果データ１０１、視点位置算出部８から出力される視点位置データ１０３、視野算出部９から出力される視野データ１０４、および視点姿勢算出部１０から出力される視点姿勢データ１０５のそれぞれに基づいて模擬視界画像１０６を生成してＣＲＴディスプレイ４に出力するものである。

【００２８】ＣＲＴディスプレイ４は、模擬視界生成装置３の生成した模擬視界画像１０６を使用者１１に対して表示するものである。次に、本実施形態の動作について以下に説明する。

【００２９】（本実施形態の動作）まず、使用者１１が磁気センサ５の設けられたヘルメット等を被り、装置を起動したと想定する。磁気センサ５は磁気源６の磁気を検知し、使用者１１の頭部のの三次元的位置を算出して、頭部位置データ１００として視点位置算出部８に出力する。

【００３０】一方、磁気センサ１における頭部の位置検出処理とは独立して、シミュレーション部８は所定の模擬計算処理を実行し、この処理結果である模擬計算結果データ１０１を出力する。この模擬計算結果データ１０１は、模擬視界生成部３に入力される。

【００３１】さらに、シミュレーション部８は、模擬計算の処理結果に基づいて、仮想空間におけるＣＲＴディスプレイ４の表示画面の三次元的な位置を算出し、この算出結果である仮想位置データ１０２を出力する。この仮想位置データ１０２は、視点位置算出部８、視野算出部９、および視点位置算出部１０のそれぞれに入力される。

【００３２】次に、視点位置算出部８は、頭部位置データ１００および仮想位置データ１０２に基づいて、仮想空間における使用者１１の視点の三次元的位置を算出し、この算出結果である視点位置データを１０３を出力する。この視点位置データ１０３は、模擬視界生成部３、視野算出部９、および視点姿勢算出部１０のそれぞれに入力される。

【００３３】次に、視野算出部９は、仮想位置データ１０１および視点位置データ１０３に基づいて、仮想空間における使用者の視点位置からＣＲＴディスプレイ４の表示画面を見た場合の仮想空間の視野を算出し、この算出結果である視野データ１０４を出力する。この視野データ１０４は模擬視界生成部３に入力される。

【００３４】一方、上述した視野算出部９とは別に、視点姿勢算出部１０は、仮想位置データ１０１および視点位置データ１０３に基づいて、仮想空間における使用者１１の視点の姿勢を算出し、この算出結果である視点姿勢データ１０５を出力する。この視点姿勢データ１０５は模擬視界生成部３に入力される。

【００３５】次に、模擬視界生成部３は、視点位置データを１０３、視野データ１０４、および視点姿勢データ１０５のそれぞれに基づいて、模擬視界画像１０６を生成して出力する。この模擬視界画像１０６はＣＲＴディスプレイ４に表示される。

【００３６】上述した通り本実施形態においては、実空間における使用者１１の視点の移動と連動して、仮想空間の使用者１１の視点が変化し、その結果が考慮されて仮想空間における模擬視界画像１０６が生成される。そのため、実空間の使用者１１の視点の動きに応じて仮想空間における模擬視界画像１０６が変化する。

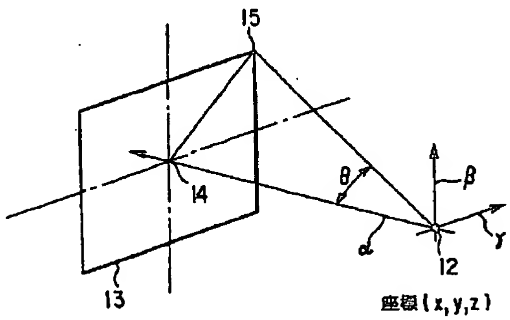
【００３７】図３は、同実施形態における視点の移動にともなう模擬視界画像１０６の変化の例を示す図である。ここで、視点１６からＣＲＴディスプレイ４の表示画面１３を見ているときは、表示画面１３には仮想空間の木１８が画像２０のように表示される。今、例えば実空間において使用者１１が身を乗り出すなどして、使用者１１の視点が視点１６から視点１７に移ったと想定する。この場合、仮想空間において視点１７からは木１８の他に石１９を見ることができるので、表示画面１３には画像２１が表示される。

【００３８】以上のように本実施形態は、実空間において使用者が頭を動かすなどして視点が移動しても、それに応じてその視点から見えるべき模擬視界画像が表示される。そのため、使用者にはＣＲＴディスプレイを見ることがあたかも現実の窓を介して景色を観察するかのように感じられて、より現実に近い感覚を得ることが可能となる。

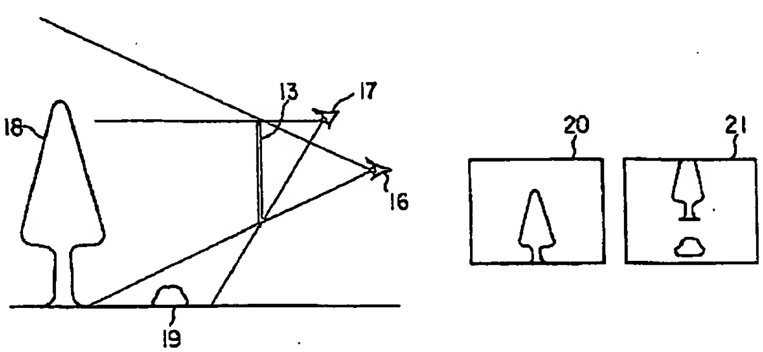
【００３９】本発明は上記実施形態に限定されるもので

はなく、次のように種々変形して実施することができる。
（１）上記実施形態では、頭部の位置検出処理は、磁気センサ５および磁気源６を有する頭部センサ１によって行われたが、ジャイロセンサ、超音波センサ、レーザ方式のセンサ、もしくはレーダ方式のセンサ、もしくは頭部をカメラ等で撮影した画像における画像処理によって行われてもよい。例えば、ジャイロセンサを用いる場合は、頭部の位置だけでなく頭部の傾きも三次元的に検出できるので、より正確な視点位置の算出が可能になる。また、これらを個別にもしくは組み合わせて実施してもよい。
（２）上記実施形態では、頭部の位置検出の結果に基づいて視点姿勢を算出したが、眼球動作を検知するアイトレーサ装置を用いて、眼球動作を直接検出してもよい。このようにすると、使用者の視線の方向が直接的に検出できるので、上記実施形態のように使用者がＣＲＴディスプレイの表示画面の中央を見ていると仮定して視点姿勢を計算する必要がなくなり、より正確な視点姿勢が算出できる。
（３）上記実施形態では、視線表示情報算出部２は、汎用計算機により構成されたが、視線表示情報算出部２の各機能を複数の汎用計算機に分割してもよく、また各機能の一部を専用の制御装置などの置き換えてもよい。さらに、模擬視界生成装置３の内部に視界情報算出装置２の各機能の一部もしくは全部を組み込んでもよい。
（４）上記実施形態ではＣＲＴディスプレイ４を用いて模擬視界画像の表示が行われたが、プロジェクタなどの各種の表示装置に置き換えてもよい。
【００４０】
【発明の効果】以上のように本発明によれば、実空間の視点の移動と連動して仮想空間における模擬視界画像が変化する模擬視界装置を提供できる。従って、本発明をシミュレータ等に適用した場合に、使用者は実際の経験に類似した感覚を得ることができる。
【図面の簡単な説明】
【図１】本発明の実施形態に係る模擬視界装置の構成を示すブロック図
【図２】同実施形態における視点位置データ、視野データ、および視点姿勢データの例を示した図
【図３】同実施形態における視点の移動にともなう模擬視界画像の変化の例を示す図
【符号の説明】
１…頭部センサ
２…視点表示情報算出部
３…模擬視界生成部
４…ＣＲＴディスプレイ
５…磁気センサ
６…磁気源
７…シミュレーション部
８…視点位置算出部
９…視野算出部
１０…視点姿勢算出部
１１…使用者
１２…視点
１３…表示画面
１４…中心
１５…右上端
１６，１７…視点
１８…木
１９…石
２０，２１…画像
１００…頭部位置データ
１０１…模擬計算結果データ
１０２…仮想位置データ
１０３…視点位置データ
１０４…視野データ
１０５…視点姿勢データ
１０６…模擬視界画像
ｘ，ｙ，ｚ…視点位置の座標
θ…視野角
α，β，γ…視点姿勢のベクトル

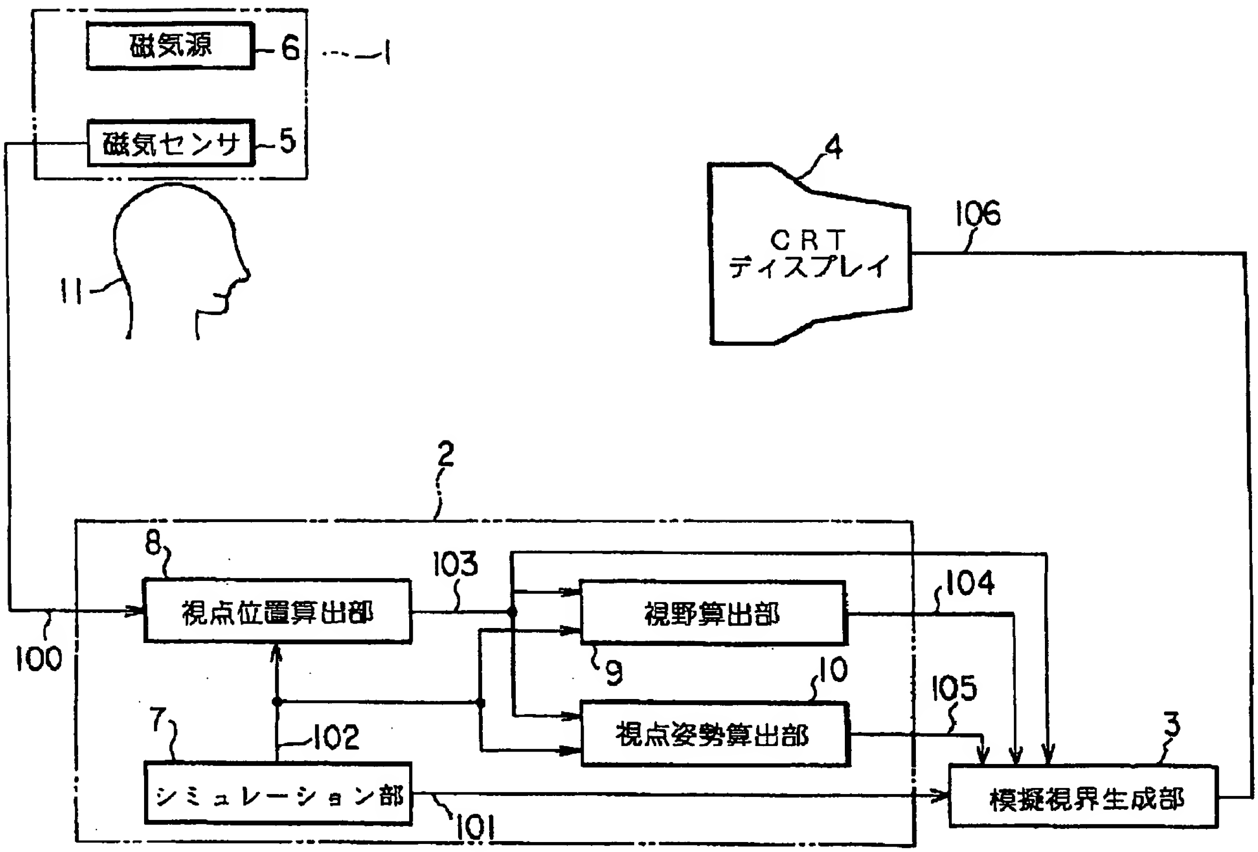
【図２】



【図３】



【図1】



フロントページの続き

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Claim 1] Simulation field-of-view equipment which is characterized by providing the following and which generates the simulation field-of-view picture according to operation of a user in the virtual space set up beforehand. A head position detection means to detect the position and posture of a head of a user in a real space. A field-of-view display information calculation means to compute each information about the position of a user's view in a virtual space, a visual field, and a posture based on the position and posture of a head of a user in the real space detected by the aforementioned head position detection means. A simulation field-of-view generation means to generate the simulation field-of-view picture which uses each information about the position of the view in the virtual space computed by the aforementioned field-of-view display information calculation means, a visual field, and a posture, and is observed from a user's view in a virtual space. A simulation field-of-view display means to display the simulation field-of-view picture generated by the aforementioned simulation field-of-view picture generation means.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the simulation field-of-view equipment applied to various kinds of simulators or the ** implement for amusement.
[0002]
[Description of the Prior Art] The simulation field-of-view equipment applied to the operation simulator and video game equipment of recent years, for example, an automobile, and the aircraft is developed. Such simulation field-of-view equipment is asked for the function in which feeling equivalent to an actual experience can be obtained according to operation of a user. Changing and expressing the result of the simulation computation which creates the target virtual space and changes according to operation of a user to a simulation field-of-view picture by the computer as one of the methods for this is performed.
[0003] With such simulation field-of-view equipment, a simulation field-of-view picture is generated as follows, for example. That is, based on a user's view in a real space, and the three-dimensions-physical relationship of the display screen, the three-dimensions-position of a user's view in a virtual space and the display screen is set up beforehand. Each information about the posture of the view at the time of seeing the display screen from a view in the size of the visual field at the time of seeing the display screen from a view in the position of the view at the time of seeing the display screen from a user's view in a virtual space and a virtual space based on this set-up position and a virtual space is computed. Based on each information about the position of these views, the size of a visual field, and the posture of a view, the simulation field-of-view picture observed from a user's view in a virtual space is generated.
[0004] Consequently, if conventional simulation field-of-view equipment is applied to the simulator of an automobilism, the view and the display screen in a virtual space will advance with simulation-advance of the automobile of a virtual space. Therefore, the simulation field-of-view picture copied out on the display screen is updated, and it will

sense as if a user actually rides in an automobile and it was going on.

[0005] By the way, in conventional simulation field-of-view equipment, the value of each information about the position of a user's view in a virtual space, the size of a visual field, and the posture of a view is set up as constant value, respectively. That is, in conventional simulation field-of-view equipment, the three-dimensions-physical relationship of the view of a virtual space and the display screen was always fixed.

[0006] By the way, generally, in order for a user to move the head or to shake a neck, the three-dimensions-physical relationship of a user's view and display may be changed in a real space. Here, it assumes it to be equivalent to people looking at a scene from an aperture in a real space to see the display screen from a user's view in a virtual space. If the position of a view is changed while people are looking at the scene from the aperture, the scene which is in sight from an aperture will change according to it, and it will be large changeless like the scene of a position near from an aperture. That is, if the position of a view changes in a virtual space, the simulation field-of-view picture of the display screen will change according to it, and the change will be considered that the place near the display screen becomes large in a virtual space.

[0007] However, even if the three-dimensions-physical relationship of the view of a virtual space and the display screen is always fixed in conventional simulation field-of-view equipment as mentioned above, and the position of the view of a real space changed, feeling which the simulation field-of-view picture of the display screen does not change, and is different from an actual experience to a user was given.

[0008]

[Problem(s) to be Solved by the Invention] Even if a user's view moved in the real space since the three-dimensions-physical relationship of the user's view and the display screen in a virtual space was always fixed in conventional simulation field-of-view equipment as mentioned above, the simulation field-of-view picture of a virtual space had the trouble of not changing. this invention aims at offering the simulation field-of-view equipment from which movement of the view of the user of a real space is interlocked with, and the simulation field-of-view picture in a virtual space changes.

[0009]

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, this invention is interlocked with change of the view of a real space, changes the view of a virtual space, and makes it the main point to generate a simulation field-of-view picture. Namely, this invention is set to the simulation field-of-view equipment which generates the simulation field-of-view picture according to operation of a user in the virtual space set up beforehand. A head position detection means to detect the position and posture of a head of a user in a real space, A field-of-view display information calculation means to compute each information about the position of a user's view in a virtual space, a visual field, and a posture based on the position and posture of a head of a user in the real space detected by the head position detection means, Each information about the position of the view in the virtual space computed by the field-of-view display information calculation means, a visual field, and a posture is used. It has a simulation field-of-view generation means to generate the simulation field-of-view picture observed from a user's view in a virtual space, and a simulation field-of-view display means to display the simulation field-of-view picture generated by the simulation field-of-view picture generation means.

[0010] In the simulation field-of-view equipment of such composition, each information about the position of the view in a virtual space, a visual field, and a posture is computed based on the position and posture of a head in a real space. And each computed information is used and the simulation field-of-view picture observed from a user's view in a virtual space is generated.
[0011] Therefore, even when a user moves the head in a real space and a view moves, the view of a virtual space changes according to change of the view of the real space. And a simulation field-of-view picture is generated based on the three-dimensions-physical relationship of the view of a virtual space and the display screen which changed. That is, since a simulation field-of-view picture also changes with movement of the view of the user of a real space, a user becomes possible [obtaining the feeling more near reality].
[0012] Here, the position of the view in a virtual space is the three-dimensions-coordinate of the view in a virtual space. Moreover, the visual field of the view in a virtual space is the size of the virtual space observed when the position of a simulation field-of-view display means is assumed to a virtual space and a simulation field-of-view display means is seen from a view. Furthermore, the posture of the view in a virtual space is the posture at the time of seeing a simulation field-of-view display means from the view of a virtual space, i.e., a user's direction of a visual axis and an inclination on either side.
[0013]
[Embodiments of the Invention]
(Composition of equipment) Drawing 1 is the block diagram showing the composition of the simulation field-of-view equipment concerning the operation form of this invention. This simulation field-of-view equipment is divided roughly, and has the head sensor 1, the view display information calculation section 2, the simulation field-of-view generation section 3, and CRT display 4.
[0014] The head sensor 1 has a magnetometric sensor 5 and the source 6 of the MAG, detects the MAG generated from the source 6 ~~of the MAG by the magnetometric sensor~~ 5, and outputs the head position data 100 which are the three-dimensions-position of a user's 11 head.
[0015] The magnetometric sensor 5 consists of a hall device, a magnetic resistance element, ~~etc.~~, is the range which can detect enough the MAG generated from the source 6 of the MAG, and is installed in the place to which a three-dimensions-relative position can be changed to the source 6 of the MAG. Specifically, a magnetometric sensor 5 is installed in the helmet with which a user 11 is covered.
[0016] The source 6 of the MAG is constituted so that uniformly [the three-dimensions-relative position to CRT display 4]. Specifically, the source 6 of the MAG is installed in the seat where a user 11 sits down, and this seat and CRT display 4 join together, and it is constituted.
[0017] The field-of-view display information calculation section 2 of this operation gestalt has the simulation section 7, the view position calculation section 8, the visual field calculation section 9, and the view posture calculation section 10, and is constituted from usual by the general-purpose computer.
[0018] The target virtual space is set up beforehand, and the simulation section 7 performs simulation computation according to operation of a user in this virtual space, and computes the position of the display screen in a virtual space based on the processing result of simulation calculation further.

[0019] Specifically, the simulation section 7 performs predetermined simulation computation according to operation of a user in a virtual space, and outputs the simulation calculation result data 101 which it is as a result of [this] processing to the simulation field-of-view generation section 3. Next, based on the result of simulation calculation, the simulation section 7 computes the three-dimensions-position of the image display section of CRT display 4 in a virtual space, and outputs the virtual position data 102 which it is as a result of [this] processing to each of the view position calculation section 7, the visual field calculation section 7, and the view posture calculation section 10.

[0020] Here, when applying for example, this operation form to an automobilism simulator, the simulation section 7 performs computation which simulates a run of an automobile, and computes the three-dimensions-position in the virtual space currently simulated about the center position of the display screen (by actual automobile, it is equivalent to a windshield) in a virtual space.

[0021] The view position calculation section 8 computes the three-dimensions-position to CRT display 4 in a user's 11 head based on the three-dimensions-physical relationship of the source 6 of the MAG and CRT display 4 which were beforehand determined as the head position data 100 outputted from the head sensor 1.

[0022] The three-dimensions-position to CRT display [in / a user's 11 head / further / in the view position calculation section 8] 4, The three-dimensions-physical relationship of the user's 11 head and view which are set up beforehand, And it is based on each of the virtual position data 102 outputted from the simulation section 7. The three-dimensions-position of a user's 11 view in a virtual space is computed, and the view position data 103 which it is as a result of [this] processing are outputted to each of the simulation field-of-view picture generation section 3, the visual field calculation section 9, and the view posture calculation section 10.

[0023] Here, the view position calculation section 8 makes the center position of a user's 11 both eyes a user's 11 view in calculation of a user's 11 three-dimensions-position in the virtual space mentioned above, and a user 11 assumes that the face is turned in the direction in which CRT display 4 is received, and computes a view position geometrically. In addition, the three-dimensions-physical relationship of a user's 11 head and a view photos a user 11 with a camera etc. beforehand, and takes the data of a position individually, and you may make it set them up based on this data.

[0024] When the display screen of CRT display 4 is seen from a user's 11 view in a virtual space based on the virtual position data 102 outputted from the simulation section 7, and the view position data 103 outputted from the view position calculation section 8, the visual field calculation section 9 computes with what visual field the picture of a virtual space is in sight, for example, shows it in an angle of visibility and the coordinate range of a virtual space, and outputs it as visual field data 104.

[0025] Based on the virtual position data 102 outputted from the simulation section 7, and the view position data 103 outputted from the view position calculation section 8, the view posture calculation section 10 computes the posture of a user's 11 view, i.e., a user's 11 direction of a visual axis and an inclination on either side, for example, shows it at a matrix, an angle, etc., and is outputted as view posture data 105.

[0026] Drawing 2 is drawing having shown the example of the view position data 103 in this operation gestalt, the visual field data 104, and the view posture data 105. It assumes

seeing the display screen 13 of CRT display 4 from a user's 11 view 12 in a virtual space now. In this case, the view position data 103 of a view 12 are shown by the coordinate (x y, z) of a virtual space. Moreover, the visual field data 104 of the virtual space when seeing the display screen 13 from the position of a view 12 are shown by the angle of visibility theta which is an angle with the straight line which connected the straight line which connected the view 12 and the center 14 of the display screen 13, and a view 12 and the upper right edge 15 of the display screen 13. Furthermore, the view posture data 105 of a view 12 are shown as vectors alpha, beta, and gamma about the center 14 of the display screen to a view 12.

[0027] Simulation field-of-view generation equipment 3 generates the simulation field-of-view picture 106 based on each of the simulation calculation result data 101 outputted from the simulation section, the view position data 103 outputted from the view position calculation section 8, the visual field data 104 outputted from the visual field calculation section 9, and the view posture data 105 outputted from the view posture calculation section 10, and outputs it to CRT display 4.

[0028] CRT display 4 displays the simulation field-of-view picture 106 which simulation field-of-view generation equipment 3 generated to a user 11. Next, operation of this operation gestalt is explained below.

[0029] (Operation of this operation gestalt) First, a user 11 is covered with the helmet with which the magnetometric sensor 5 was formed, and assumes that equipment was started. A magnetometric sensor 5 detects the MAG of the source 6 of the MAG, computes the three-dimensions-position of a user's 11 ******, and outputs it to the view position calculation section 8 as head position data 100.

[0030] On the other hand, the simulation section 8 performs predetermined simulation computation, and position detection processing of the head in a magnetometric sensor 1 outputs independently the simulation calculation result data 101 which it is as a result of [this] processing. This simulation calculation result data 101 is inputted into the simulation field-of-view generation section 3.

[0031] Furthermore, based on the processing result of simulation calculation, the simulation section 8 computes the three-dimensions-position of the display screen of CRT display 4 in a virtual space, and outputs the virtual position data 102 which it is as a result of [this] calculation. This virtual position data 102 is inputted into each of the view position calculation section 8, the visual field calculation section 9, and the view position calculation section 10.

[0032] Next, based on the head position data 100 and the virtual position data 102, the view position calculation section 8 computes the three-dimensions-position of a user's 11 view in a virtual space, and outputs 103 for the view position data which it is as a result of [this] calculation. This view position data 103 is inputted into each of the simulation field-of-view generation section 3, the visual field calculation section 9, and the view posture calculation section 10.

[0033] Next, the visual field calculation section 9 computes the visual field of the virtual space at the time of seeing the display screen of CRT display 4 from a user's view position in a virtual space based on the virtual position data 101 and the view position data 103, and outputs the visual field data 104 which it is as a result of [this] calculation. This visual field data 104 is inputted into the simulation field-of-view generation section 3.

[0034] On the other hand, independently [the visual field calculation section 9 mentioned above], based on the virtual position data 101 and the view position data 103, the view posture calculation section 10 computes the posture of a user's 11 view in a virtual space, and outputs the view posture data 105 which it is as a result of [this] calculation. This view posture data 105 is inputted into the simulation field-of-view generation section 3.
[0035] Next, based on each of 103, the visual field data 104, and the view posture data 105, the simulation field-of-view generation section 3 generates the simulation field-of-view picture 106, and outputs view position data. This simulation field-of-view picture 106 is displayed on CRT display 4.
[0036] In this operation gestalt, movement of a user's 11 view in a real space is interlocked with, the view of the user 11 of a virtual space changes, the result is taken into consideration, and the simulation field-of-view picture 106 in a virtual space is generated as mentioned above. Therefore, according to the movement of the view of the user 11 of a real space, the simulation field-of-view picture 106 in a virtual space changes.
[0037] Drawing 3 is drawing showing the example of change of the simulation field-of-view picture 106 accompanying movement of the view in this operation gestalt. Here, while seeing the display screen 13 of CRT display 4 from the view 16, the tree 18 of a virtual space is displayed on the display screen 13 like a picture 20. A user 11 leans out in now, for example, a real space, and it is assumed that a user's 11 view moved from the view 16 to the view 17. In this case, since the stone 19 other than a tree 18 can be seen from a view 17 in a virtual space, a picture 21 is displayed on the display screen 13.
[0038] As mentioned above, even if a user moves the head in a real space and a view moves this operation form, the simulation field-of-view picture which should be in sight from the view according to it is displayed. Therefore, it senses as if seeing a CRT display to a user observed the scene through the actual aperture, and it becomes possible to obtain the feeling more near reality.
[0039] this invention is not limited to the above-mentioned operation form, can deform variously as follows and can be carried out.
(1) With the above-mentioned operation form, although position detection processing of a head was performed by the head sensor 1 which has a magnetometric sensor 5 and the source 6 of the MAG, it may be performed by the image processing in the picture which photoed a gyroscope sensor, the ultrasonic sensor, the sensor of a laser method, the sensor of radar system, or the head with the camera etc. For example, since it can detect in [not only the position of a head but the inclination of a head] three dimensions when using a gyroscope sensor, calculation of a more exact view position is attained. Moreover, individually, it may combine and these may be carried out.
(2) With the above-mentioned operation form, although the view posture was computed based on the result of position detection of a head, you may carry out direct detection of the eyeball operation using the eye marker equipment which detects eyeball operation. If it does in this way, since the direction of a user's look can detect directly, it becomes unnecessary to calculate a view posture by assuming that the user is looking at the center of the display screen of a CRT display like the above-mentioned operation form, and a more exact view posture can be computed.
(3) With the above-mentioned operation form, although constituted by the general-purpose computer, each function of the look display information calculation section 2

may be divided into two or more general-purpose computers, and, as for the look display information calculation section 2, the control unit of exclusive use etc. may replace a part of each function. Furthermore, you may also include a part or all of each function of field-of-view information calculation equipment 2 in the interior of simulation field-of-view generation equipment 3.
(4) Although the display of a simulation field-of-view picture was performed using CRT display 4 with the above-mentioned operation form, you may transpose to various kinds of display, such as a projector.
[0040]
[Effect of the Invention] According to this invention, the simulation field-of-view equipment from which movement of the view of a real space is interlocked with, and the simulation field-of-view picture in a virtual space changes can be offered as mentioned above. Therefore, when this invention is applied to a simulator etc., a user can get feeling similar to an actual experience.

TECHNICAL FIELD

[The technical field to which invention belongs] this invention relates to the simulation field-of-view equipment applied to various kinds of simulators or the ** implement for amusement.

PRIOR ART

[Description of the Prior Art] The simulation field-of-view equipment applied to the operation simulator and video game equipment of recent years, for example, an automobile, and the aircraft is developed. Such simulation field-of-view equipment is asked for the function in which feeling equivalent to an actual experience can be obtained according to operation of a user. Changing and expressing the result of the simulation computation which creates the target virtual space and changes according to operation of a user to a simulation field-of-view picture by the computer as one of the methods for this is performed.
[0003] With such simulation field-of-view equipment, a simulation field-of-view picture is generated as follows, for example. That is, based on a user's view in a real space, and the three-dimensions-physical relationship of the display screen, the three-dimensions-position of a user's view in a virtual space and the display screen is set up beforehand. Each information about the posture of the view at the time of seeing the display screen from a view in the size of the visual field at the time of seeing the display screen from a view in the position of the view at the time of seeing the display screen from a user's view in a virtual space and a virtual space based on this set-up position and a virtual space is computed. Based on each information about the position of these views, the size of a visual field, and the posture of a view, the simulation field-of-view picture observed from a user's view in a virtual space is generated.
[0004] Consequently, if conventional simulation field-of-view equipment is applied to the simulator of an automobilism, the view and the display screen in a virtual space will advance with simulation-advance of the automobile of a virtual space. Therefore, the simulation field-of-view picture copied out on the display screen is updated, and it will

sense as if a user actually rides in an automobile and it was going on.
[0005] By the way, in conventional simulation field-of-view equipment, the value of each information about the position of a user's view in a virtual space, the size of a visual field, and the posture of a view is set up as constant value, respectively. That is, in conventional simulation field-of-view equipment, the three-dimensions-physical relationship of the view of a virtual space and the display screen was always fixed.
[0006] By the way, generally, in order for a user to move the head or to shake a neck, the three-dimensions-physical relationship of a user's view and display may be changed in a real space. Here, it assumes it to be equivalent to people looking at a scene from an aperture in a real space to see the display screen from a user's view in a virtual space. If the position of a view is changed while people are looking at the scene from the aperture, the scene which is in sight from an aperture will change according to it, and it will be large changeless like the scene of a position near from an aperture. That is, if the position of a view changes in a virtual space, the simulation field-of-view picture of the display screen will change according to it, and the change will be considered that the place near the display screen becomes large in a virtual space.
[0007] However, even if the three-dimensions-physical relationship of the view of a virtual space and the display screen is always fixed in conventional simulation field-of-view equipment as mentioned above, and the position of the view of a real space changed, feeling which the simulation field-of-view picture of the display screen does not change, and is different from an actual experience to a user was given.

EFFECT OF THE INVENTION

[Effect of the Invention] According to this invention, the simulation field-of-view equipment from which movement of the view of a real space is interlocked with, and the simulation field-of-view picture in a virtual space changes can be offered as mentioned above. Therefore, when this invention is applied to a simulator etc., a user can get feeling similar to an actual experience.

So ... goes for sound as well

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] Even if a user's view moved in the real space since the three-dimensions-physical relationship of the user's view and the display screen in a virtual space was always fixed in conventional simulation field-of-view equipment as mentioned above, the simulation field-of-view picture of a virtual space had the trouble of not changing. this invention aims at offering the simulation field-of-view equipment from which movement of the view of the user of a real space is interlocked with, and the simulation field-of-view picture in a virtual space changes.
MEANS

[Means for Solving the Problem] In order to solve the above-mentioned technical problem, this invention is interlocked with change of the view of a real space, changes the view of a virtual space, and makes it the main point to generate a simulation field-of-view picture. Namely, this invention is set to the simulation field-of-view equipment

which generates the simulation field-of-view picture according to operation of a user in the virtual space set up beforehand. A head position detection means to detect the position and posture of a head of a user in a real space, A field-of-view display information calculation means to compute each information about the position of a user's view in a virtual space, a visual field, and a posture based on the position and posture of a head of a user in the real space detected by the head position detection means, Each information about the position of the view in the virtual space computed by the field-of-view display information calculation means, a visual field, and a posture is used. It has a simulation field-of-view generation means to generate the simulation field-of-view picture observed from a user's view in a virtual space, and a simulation field-of-view display means to display the simulation field-of-view picture generated by the simulation field-of-view picture generation means.

[0010] In the simulation field-of-view equipment of such composition, each information about the position of the view in a virtual space, a visual field, and a posture is computed based on the position and posture of a head in a real space. And each computed information is used and the simulation field-of-view picture observed from a user's view ~~in a vir~~tual space is generated.

[0011] Therefore, even when a user moves the head in a real space and a view moves, the view of a virtual space changes according to change of the view of the real space. And a simulation field-of-view picture is generated based on the three-dimensions-physical relationship of the view of a virtual space and the display screen which changed. That is, since a simulation field-of-view picture also changes with movement of the view of the user of a real space, a user becomes possible [obtaining the feeling more near reality].

[0012] Here, the position of the view in a virtual space is the three-dimensions-coordinate of the view in a virtual space. Moreover, the visual field of the view in a virtual space is the size of the virtual space observed when the position of a simulation field-of-view display means is assumed to a virtual space and a simulation field-of-view display means is seen from a view. Furthermore, the posture of the view in a virtual space is the posture at the time of seeing a simulation field-of-view display means from the view of a virtual space, i.e., a user's direction of a visual axis and an inclination on either side.

[0013]

[Embodiments of the Invention]

(Composition of equipment) Drawing 1 is the block diagram showing the composition of the simulation field-of-view equipment concerning the operation gestalt of this invention. This simulation field-of-view equipment is divided roughly, and has the head sensor 1, the view display information calculation section 2, the simulation field-of-view generation section 3, and CRT display 4.

[0014] The head sensor 1 has a magnetometric sensor 5 and the source 6 of the MAG, detects the MAG generated from the source 6 of the MAG by the magnetometric sensor 5, and outputs the head position data 100 which are the three-dimensions-position of a user's 11 head.

[0015] The magnetometric sensor 5 consists of a hall device, a magnetic resistance element, etc., is the range which can detect enough the MAG generated from the source 6 of the MAG, and is installed in the place to which a three-dimensions-relative position can be changed to the source 6 of the MAG. Specifically, a magnetometric sensor 5 is installed in the helmet with which a user 11 is covered.

[0016] The source 6 of the MAG is constituted so that uniformly [the three-dimensions-relative position to CRT display 4]. Specifically, the source 6 of the MAG is installed in the seat where a user 11 sits down, and this seat and CRT display 4 join together, and it is constituted.
[0017] The field-of-view display information calculation section 2 of this operation gestalt has the simulation section 7, the view position calculation section 8, the visual field calculation section 9, and the view posture calculation section 10, and is constituted from usual by the general-purpose computer.
[0018] The target virtual space is set up beforehand, and the simulation section 7 performs simulation computation according to operation of a user in this virtual space, and computes the position of the display screen in a virtual space based on the processing result of simulation calculation further.
[0019] Specifically, the simulation section 7 performs predetermined simulation computation according to operation of a user in a virtual space, and outputs the simulation calculation result data 101 which it is as a result of [this] processing to the simulation field-of-view generation section 3. Next, based on the result of simulation calculation, the simulation section 7 computes the three-dimensions-position of the image display section of CRT display 4 in a virtual space, and outputs the virtual position data 102 which it is as a result of [this] processing to each of the view position calculation section 7, the visual field calculation section 7, and the view posture calculation section 10.
[0020] Here, when applying for example, this operation gestalt to an automobilism simulator, the simulation section 7 performs computation which simulates a run of an automobile, and computes the three-dimensions-position in the virtual space currently simulated about the center position of the display screen (by actual automobile, it is equivalent to a windshield) in a virtual space.
[0021] The view position calculation section 8 computes the three-dimensions-position to CRT display 4 in a user's 11 head based on the three-dimensions-physical relationship of the source 6 of the MAG and CRT display 4 which were beforehand determined as the head position data 100 outputted from the head sensor 1.
[0022] The three-dimensions-position to CRT display [in / a user's 11 head / further / in the view position calculation section 8] 4, The three-dimensions-physical relationship of the user's 11 head and view which are set up beforehand, And it is based on each of the virtual position data 102 outputted from the simulation section 7. The three-dimensions-position of a user's 11 view in a virtual space is computed, and the view position data 103 which it is as a result of [this] processing are outputted to each of the simulation field-of-view picture generation section 3, the visual field calculation section 9, and the view posture calculation section 10.
[0023] Here, the view position calculation section 8 makes the center position of a user's 11 both eyes a user's 11 view in calculation of a user's 11 three-dimensions-position in the virtual space mentioned above, and a user 11 assumes that the face is turned in the direction in which CRT display 4 is received, and computes a view position geometrically. In addition, the three-dimensions-physical relationship of a user's 11 head and a view photos a user 11 with a camera etc. beforehand, and takes the data of a position individually, and you may make it set them up based on this data.
[0024] When the display screen of CRT display 4 is seen from a user's 11 view in a

virtual space based on the virtual position data 102 outputted from the simulation section 7, and the view position data 103 outputted from the view position calculation section 8, the visual field calculation section 9 computes with what visual field the picture of a virtual space is in sight, for example, shows it in an angle of visibility and the coordinate range of a virtual space, and outputs it as visual field data 104.

[0025] Based on the virtual position data 102 outputted from the simulation section 7, and the view position data 103 outputted from the view position calculation section 8, the view posture calculation section 10 computes the posture of a user's 11 view, i.e., a user's 11 direction of a visual axis and an inclination on either side, for example, shows it at a matrix, an angle, etc., and is outputted as view posture data 105.

[0026] Drawing 2 is drawing having shown the example of the view position data 103 in this operation gestalt, the visual field data 104, and the view posture data 105. It assumes seeing the display screen 13 of CRT display 4 from a user's 11 view 12 in a virtual space now. In this case, the view position data 103 of a view 12 are shown by the coordinate (x y, z) of a virtual space. Moreover, the visual field data 104 of the virtual space when seeing the display screen 13 from the position of a view 12 are shown by the angle of visibility theta which is an angle with the straight line which connected the straight line which connected the view 12 and the center 14 of the display screen 13, and a view 12 and the upper right edge 15 of the display screen 13. Furthermore, the view posture data 105 of a view 12 are shown as vectors alpha, beta, and gamma about the center 14 of the display screen to a view 12.

[0027] Simulation field-of-view generation equipment 3 generates the simulation field-of-view picture 106 based on each of the simulation calculation result data 101 outputted from the simulation section, the view position data 103 outputted from the view position calculation section 8, the visual field data 104 outputted from the visual field calculation section 9, and the view posture data 105 outputted from the view posture calculation section 10, and outputs it to CRT display 4.

[0028] CRT display 4 displays the simulation field-of-view picture 106 which simulation field-of-view generation equipment 3 generated to a user 11. Next, operation of this operation gestalt is explained below.

[0029] (Operation of this operation gestalt) First, a user 11 is covered with the helmet with which the magnetometric sensor 5 was formed, and assumes that equipment was started. A magnetometric sensor 5 detects the MAG of the source 6 of the MAG, computes the three-dimensions-position of a user's 11 ******, and outputs it to the view position calculation section 8 as head position data 100.

[0030] On the other hand, the simulation section 8 performs predetermined simulation computation, and position detection processing of the head in a magnetometric sensor 1 outputs independently the simulation calculation result data 101 which it is as a result of [this] processing. This simulation calculation result data 101 is inputted into the simulation field-of-view generation section 3.

[0031] Furthermore, based on the processing result of simulation calculation, the simulation section 8 computes the three-dimensions-position of the display screen of CRT display 4 in a virtual space, and outputs the virtual position data 102 which it is as a result of [this] calculation. This virtual position data 102 is inputted into each of the view position calculation section 8, the visual field calculation section 9, and the view position calculation section 10.

[0032] Next, based on the head position data 100 and the virtual position data 102, the view position calculation section 8 computes the three-dimensions-position of a user's 11 view in a virtual space, and outputs 103 for the view position data which it is as a result of [this] calculation. This view position data 103 is inputted into each of the simulation field-of-view generation section 3, the visual field calculation section 9, and the view posture calculation section 10.
[0033] Next, the visual field calculation section 9 computes the visual field of the virtual space at the time of seeing the display screen of CRT display 4 from a user's view position in a virtual space based on the virtual position data 101 and the view position data 103, and outputs the visual field data 104 which it is as a result of [this] calculation. This visual field data 104 is inputted into the simulation field-of-view generation section 3.
[0034] On the other hand, independently [the visual field calculation section 9 mentioned above], based on the virtual position data 101 and the view position data 103, the view posture calculation section 10 computes the posture of a user's 11 view in a virtual space, and outputs the view posture data 105 which it is as a result of [this] calculation. This view posture data 105 is inputted into the simulation field-of-view generation section 3.
[0035] Next, based on each of 103, the visual field data 104, and the view posture data 105, the simulation field-of-view generation section 3 generates the simulation field-of-view picture 106, and outputs view position data. This simulation field-of-view picture 106 is displayed on CRT display 4.
[0036] In this operation gestalt, movement of a user's 11 view in a real space is interlocked with, the view of the user 11 of a virtual space changes, the result is taken into consideration, and the simulation field-of-view picture 106 in a virtual space is generated as mentioned above. Therefore, according to the movement of the view of the user 11 of a real space, the simulation field-of-view picture 106 in a virtual space changes.
[0037] Drawing 3 is drawing showing the example of change of the simulation field-of-view picture 106 accompanying movement of the view in this operation gestalt. Here, while seeing the display screen 13 of CRT display 4 from the view 16, the tree 18 of a virtual space is displayed on the display screen 13 like a picture 20. A user 11 leans out in now, for example, a real space, and it is assumed that a user's 11 view moved from the view 16 to the view 17. In this case, since the stone 19 other than a tree 18 can be seen from a view 17 in a virtual space, a picture 21 is displayed on the display screen 13.
[0038] As mentioned above, even if a user moves the head in a real space and a view moves this operation gestalt, the simulation field-of-view picture which should be in sight from the view according to it is displayed. Therefore, it senses as if seeing a CRT display to a user observed the scene through the actual aperture, and it becomes possible to obtain the feeling more near reality.
[0039] this invention is not limited to the above-mentioned operation gestalt, can deform variously as follows and can be carried out.
(1) With the above-mentioned operation gestalt, although position detection processing of a head was performed by the head sensor 1 which has a magnetometric sensor 5 and the source 6 of the MAG, it may be performed by the image processing in the picture which photoed a gyroscope sensor, the ultrasonic sensor, the sensor of a laser method, the sensor of radar system, or the head with the camera etc. For example, since it can detect

in [not only the position of a head but the inclination of a head] three dimensions when using a gyroscope sensor, calculation of a more exact view position is attained. Moreover, individually, it may combine and these may be carried out.
(2) With the above-mentioned operation gestalt, although the view posture was computed based on the result of position detection of a head, you may carry out direct detection of the eyeball operation using the eye marker equipment which detects eyeball operation. If it does in this way, since the direction of a user's visual axis can detect directly, it becomes unnecessary to calculate a view posture by assuming that the user is looking at the center of the display screen of a CRT display like the above-mentioned operation gestalt, and a more exact view posture can be computed.
(3) With the above-mentioned operation gestalt, although constituted by the general-purpose computer, each function of the visual-axis display information calculation section 2 may be divided into two or more general-purpose computers, and, as for the visual-axis display information calculation section 2, the control unit of exclusive use etc. may replace a part of each function. Furthermore, you may also include a part or all of each function of field-of-view information calculation equipment 2 in the interior of simulation field-of-view generation equipment 3.
(4) Although the display of a simulation field-of-view picture was performed using CRT display 4 with the above-mentioned operation form, you may transpose to various kinds of display, such as a projector.
DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The block diagram showing the composition of the simulation field-of-view equipment concerning the operation gestalt of this invention
[Drawing 2] Drawing having shown the example of the view position data in this operation gestalt, visual field data, and view posture data
[Drawing 3] Drawing showing the example of change of the simulation field-of-view picture accompanying movement of the view in this operation gestalt
[Description of Notations]
1 -- Head sensor
2 -- View display information calculation section
3 -- Simulation field-of-view generation section
4 -- CRT display
5 -- Magnetometric sensor
6 -- Source of the MAG
7 -- Simulation section
8 -- View position calculation section
9 -- Visual field calculation section
10 -- View posture calculation section
11 -- User
12 -- View
13 -- Display screen
14 -- Center
15 -- Upper right edge
16 17 -- View

18 -- Tree
19 -- Stone
20 21 -- Picture
100 -- Head position data
101 -- Simulation calculation result data
102 -- Virtual position data
103 -- View position data
104 -- Visual field data
105 -- View posture data
106 -- Simulation field-of-view picture
x y, z -- Coordinate of a view position
theta -- Angle of visibility
alpha, beta, gamma -- Vector of a view posture